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A SEARCH FOR A NEW AIRCREW SPECTACLE FRAME.(U)
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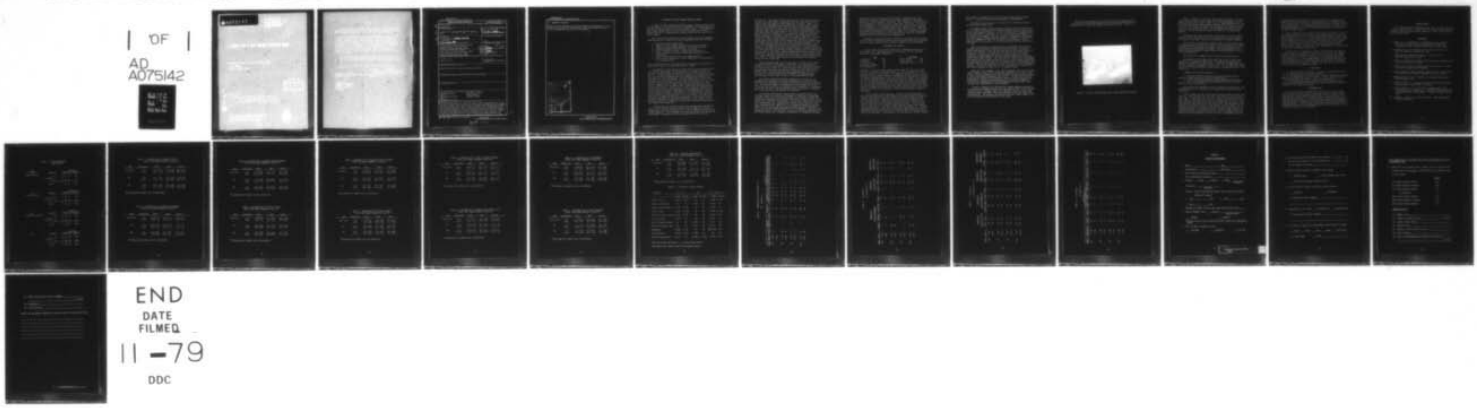

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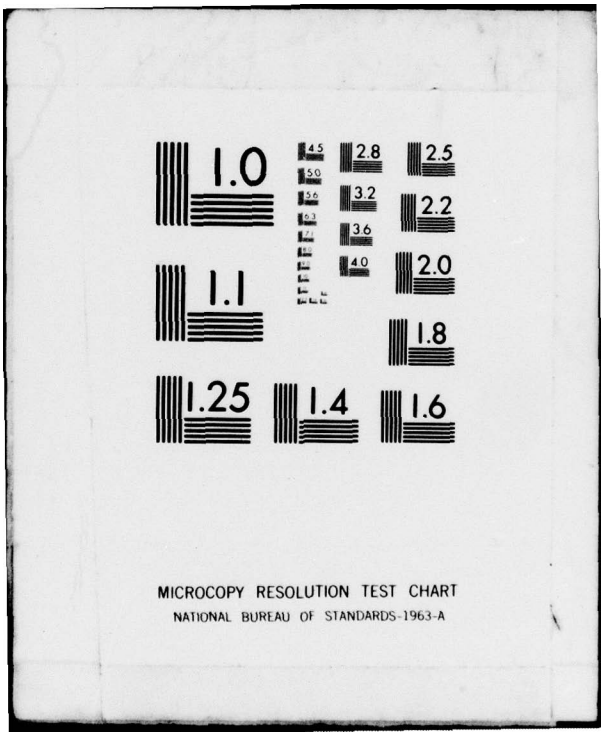
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The factors necessary for a spectacle frame to meet acceptability for aircrew use were defined. The rising price of gold used in the HGU-4/P frame triggered triservice consideration for a change in materials and configuration of the aircrew spectacle frame. Optyl, a thermosetting plastic, presented potential for spectacle frame use in worldwide climates, and a field test was conducted to explore that potential and its acceptability by service personnel. The results were favorable for the use of thermosetting plastic based on the result of the analysis of wide-ranging questionnaire responses by Air Force

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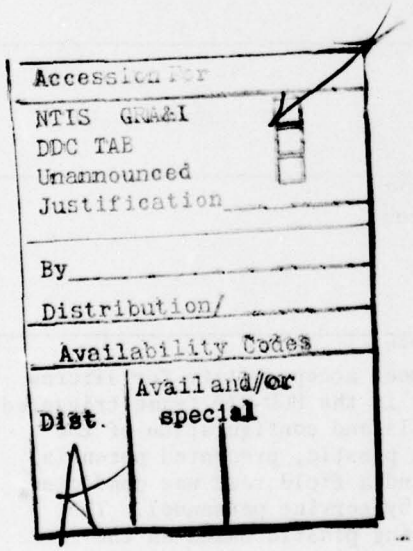
20. ABSTRACT (continued)

subjects, and the reactions of opticians assembling the spectacles. At the end of the test period the HGU-4/P metal frame scored somewhat higher on overall acceptability than the Optyl 1019 frame.



A SEARCH FOR A NEW AIRCREW SPECTACLE FRAME

In 1958, the USAF adopted the HGU-4/P sunglass spectacles for use by aircrew members (1), and the item was subsequently also standardized by the other military services for issue to their flyers. This gold-filled metal frame replaced the F-2 plastic frame issued for use in arctic regions and the G-2 rhodium-plated frame provided for flyer wear in all other regions.

The criteria for acceptability used by Major Hirsch for evaluating competing spectacle frames for aircrew requirements were well defined:

1. Worldwide climatic application
2. Comfort in wear-weight, adjustability, and fit retention
3. Integration with flight equipment - rapid don and doff
4. Minimal peripheral field of view restriction
5. Inert to dermal reactions--allergy and discoloration
6. Frame acceptance of lenses without undue optical or tint limitations
7. Manufacturing specifications for standardization
8. Cost - wearer acceptance, initial expenditure, and maintenance or replacement costs

These considerations are still applicable in weighing the candidacy of replacement frames for the HGU-4/P spectacle frame.

The optometry chiefs of the Air Force and Navy met informally with a Fort Rucker-based Army research optometrist in June 1969 (2) and discussed an Army proposal to develop a plastic frame to replace the HGU-4/P. At that period, the press was heralding a worldwide gold shortage, and HGU-4/P procurement and/or cost problems were foreseen as a consequence of that development. The Army approach to a new aircrew spectacle was to retain the size and shape of the HGU-4/P lenses, and to use black cellulose acetate plastic as the carrier material. Three optical companies were to submit sample frames developed under tri-service contract, and a field test was to determine which manufacturer had the best product. The Navy and Air Force optometry chiefs did not concur because of perceived drawbacks in using thermoplastic material in the flying environment. Subsequently, the Army decided to unilaterally develop the frame and wear-test it. Helicopter and fixed-wing Army aviators comprised more than 2/3 of the subjects, and non-aircrew personnel completed the remaining participants. Sixty-seven percent indicated discomfort in wearing the spectacles with a helmet, and 56 percent rated the test frame not as good, and 17 percent about equal to the standard metal frame (3).

The popularity of the HGU-4/P frame has remained high through the years. The "Air Force look" was made available commercially by the manufacturer, and men and women of the civilian community proudly sport flight sunglasses. Base exchanges sell this design over the counter, and ground-bound personnel and military dependents accent the frame

desirability. While most military aircrew users find these spectacles satisfy their requirements, complaints about the shortcomings of the HGU-4/P have been registered with regularity by flyers. When it was apparent that individuals with prominent noses and/or built-up oxygen masks had their HGU-4/P frames ride too high, a wide-bridged plastic frame was authorized for the flight use of these aircrew members (4). Complaints about the displacement of the frame in head-down and/or forward body-bending movements, with a significant number of pitted and broken lenses as a consequence, resulted in the standardization of a riding bow temple as a substitute for the spatula temple (5). Discomfort due to helmet headset pressure on the ear against the plastic-tipped temple and/or engine noise leakage when the spatula temple broke the headset seal has been one of the most persistent problems. If the flyer could accomplish his mission with the riding bow temple, this solved the discomfort-noise difficulty; however, if the quick don-doff capability was needed, there was no ready solution. Optimum frame fit by eye clinic personnel was usually advised to minimize ear cup lift-off and pressure pain on the pinna. Helmet-attached spectacles are under investigation as a possible remedy of this difficulty. A wider field of view in a flight frame was a periodic TAC flyer request, and a minimum thickness eyewire to reduce frame obstruction in refueling and formation flying was also voiced (6).

Gold was decontrolled by the United States in 1973, and the price of gold-filled HGU-4/P increased as predicted. Electroplating was proposed in lieu of gold filling to cut cost, and an increase in allergic reactions was feared (7). Manufacturers' tests and assurances (8) assuaged these fears, and plating was accepted for the finish of the HGU-4/P frame. Allergic reactions have apparently been few, for no official nor informal reports have circulated concerning untoward dermatological effects from the wear of the plated HGU-4/P frame.

The US Army Aeromedical Research Laboratory, Ft Rucker AL, in September 1975, proposed a triservice meeting at their location "for the purpose of evaluating the future of the present metal flying goggle" (9). An extensive number of considerations was incorporated in the letter for the recipients to contemplate in the retention or replacement of the HGU-4/P frame. The meeting was held as scheduled on 13 January 1976, and triservice representation was realized.

To facilitate discussion, sample frames in varying designs and different metals and plastics were brought by several of the attendees. It became evident as the meeting proceeded that the HGU-4/P frame presented major advantages over the many competitive eyewear products circulating for the group's consideration. One possible rival from a composition consideration was a thermosetting plastic frame produced by the Optyl Corporation (10), Model 1019, in a thermosetting plastic material (Optyl) for the front, and white metal temples with skull-type Optyl tips, that had been company-designed with a contemporary, stylish, large eyewire just prior to the meeting. It was not available commercially in the United States, and a company representative, in bringing this frame

and material to the attention of the attendees through the Air Force delegates, indicated a willingness to produce sufficient samples for a field test of their product, if desired. The advantages of thermosetting over thermoplastic composed plastic frames were cited to be: ability to hold adjustment (i.e., no creep of the material with body heat); thinner plastic dimensions; and a hypoallergenic (10) characteristic. Additionally, compared with an equivalent metal frame, Optyl is lighter in weight. An unresolved consideration is that the product is an Austrian developed material which has franchises in the United States, but this could make comparative costs with the HGU-4/P problematical.

The Army and Air Force agreed to joint-test the Optyl material under varied climatic conditions and, while the Navy representative was desirous of that service's participation, internal support was not forthcoming.

PROCEDURE AND FINDINGS

The Air Force and the Army contracted for 300 Optyl frames each, in Model Number 1019, and proposed test and evaluation at the following locations in the number designated:

ARMY			AIR FORCE		
Ft Rucker AL	-	100	Minot AFB ND	-	100
Ft Hood TX	-	50	Nellis AFB NV	-	100
Ft Campbell KY	-	50	Charleston AFB SC	-	100
Canal Zone, Panama	-	50			
Ft Richardson AK	-	50			

Volunteers in aircrew flight support status agreed to wear their choice of clear or sunglass prescription lenses or, where appropriate, plano sunglass lenses in these frames. The optometry clinics at the test sites provided the most recent refractive information for the spectacle orders. The frames were manufactured clear or black and the temples were provided in skull or spatula design. The spatula temple was similar in configuration to the HGU-4/P, but the plastic butt end was thinner at the request of the Air Force-Army monitors. This was done with the expectation that ear cup pressure on the pinna over the temple plastic would be less than with the standard HGU-4/P temple. The metal support rod of either of the temples was "silver" in color and of good tensile strength to maintain adjustment.

It was decided to have personnel from the US Army Aeromedical Research Laboratory and the USAF School of Aerospace Medicine (USAFSAM) dispense the spectacles to the volunteers to assure optimum fit and subject cooperation. Inspection of the frames after 4 months of use for identification of short-term problems and at the 1-year point for longer range effects was planned by monitor personnel. The Air Force initial inspection visit slipped 1 month and was accomplished 5 months into the wear period. The Optical Fabrication Laboratory, at Fitzsimons Army Medical Center, Denver CO, fabricated the Army spectacles, and the USAFSAM Research Optical Laboratory, at Brooks AFB TX, furnished the Air Force test spectacles. Questionnaires were designed for subject response

with respect to comparisons of the test frame and materials with the HGU-4/P. A copy of the questionnaire appears in the Appendix.

The balance of this report is confined to the field test results obtained from the USAF study.

The reader should be aware that Minot AFB ND, the cold weather test site, is under the Strategic Air Command; Charleston AFB SC, the moderate to hot, high humidity location, is in the Military Airlift Command; and that Nellis AFB NV, the moderate to hot, dry and dusty environment, is in the Tactical Air Command. There may well be a philosophical difference in attitude toward testing personal equipment by members of the different major air commands, and this was considered in test design so that a representative cross-section of Air Force personnel might be involved in the study.

Table 1 illustrates the participation by personnel from each base involved, and the total for subjects at all three bases. To assure reader-understanding of the figures presented, an illustration using the ND matrix is offered. The upper left box, which falls in the "Yes" designation vertically and horizontally, indicates that 49 subjects reported for frame examination and questionnaire completion at both the 5-month and 12-month checks. The lower left box shows that 34 individuals participated in the 5-month evaluation but not in the 12-month evaluation. Four participants did not show for the 5-month check but did report at the 12-month term, and these appear in the "No" vertically, "Yes" horizontally location. The 13 that fell into the "No" vertically, "No" horizontally box did not respond to either the 5- or 12-month checks.

Under the "All" category, it is readily apparent that out of the 300 frames issued, a total of 122 frames were evaluated at both check times (40.7%), 220 were checked at the 5-month period (73.3%), and that dropped to 140 at the 12-month appraisal time (46.7%). The Nellis AFB participation was the lowest, but the greatest number of aircrew subjects were located here. The drop in participation at this location apparently resulted from unexpected TDY and reassignment affecting the TAC flyers that were not forecastable at study inception.

It may be presumptive to conclude that random sampling prevailed in the subjective responses obtained from approximately half of the original 300 participants. However, there is no apparent reason to believe the respondees were "different" from those subjects who did not input their questionnaires. The analysis that follows assumes a random sample of the Air Force population was effected in this study.

While the prime purpose of this effort was to test Optyl material for suitability in worldwide operations, the study did concentrate on a comparison of the Optyl 1019 frame and the HGU-4/P frame. (Fig. 1)

Figure 1. HGU-4/P Aircrew frame (left), Optyl 1019 frame (right).

Tables 2 through 11 display the participants' scalings in the frame comparisons for items 12(a) through 12(j) in the questionnaire at the end of 5 months and 12 months. The 5- and 12-month notations show the percentage of subjects that thought the Optyl 1019 frame was worse, same, or better than the HGU-4/P frame plus the sample size, shown in parentheses, in each opinion category. The percentages for ND and SC were generally in good agreement and hence the reason for recording them together.

In general, with some exceptions, the NV data shows little preference for either frame while the SC and ND data show a rather strong preference for the Optyl frame when considering the opinion categories.

On the overall acceptability category, Table 12, the NV data shows a strong preference for the metal frame on both evaluations while the SC and ND data show a preference for Optyl at the 5-month evaluation but no preference for either frame at 12 months. Overall acceptability was derived from the narrative comments made by the participants at the end of the questionnaire.

See Table 13 for a summary of the statistical testing results.

The breakout of the flight status and time of wear of the frames (question 3) is given in Table 14(a). The responses to questions 4 through 10 are detailed in Table 14(b). The choice of frame color which question 11 posed is presented in Table 14(c). It is evident that black was the first choice, followed by smoke (gray) coloring, with clear a close runner-up.

A summary of the survey findings is:

1. Using the overall acceptability rating, the HGU-4/P frame generally scored higher than the Optyl frame tested.
2. In specific areas the Optyl frame was generally rated higher.
3. Black is considered the most acceptable color for a plastic frame by aircrew and nonflyers.

Some observations reported by optical laboratory personnel and wear-test participants are considered to be significant in frame material comparisons.

Plastic frames are more "forgiving" than metal frames and Optyl bore this out. Opticians must size the lenses precisely for insertion into metal rims. A too large lens will leave a gap in the end piece and/or it will "flake" at the edge after excessive pressure takes its toll; a too small lens may drop out of the frame at an unexpected time and/or a lens shim detracts from a quality optical appearance. The contraction after heating of the plastic eyewires around lenses that are slightly off-size reduces the need for the careful handwork that metal frames require in lens bevel edging. The mounting of lenses in metal frames requires the handling of 4 small screws which hold the lenses and temples in place. This necessitates good hand-eye dexterity and is considerably more time

consuming than that required for the plastic frames. Standard plastic fronts and associated temples are often provided in the assembled state, and the optician does not need to process these spectacles beyond the lens insertion operation. If the temples require replacing, two large-sized screws are needed for the plastic frame, rather than 4 tiny screws that the HGU-4/P frame requires.

Within a month of the dispensing of the Optyl test frame, 6 frames of the 300 dispensed by the Air Force were returned because eyewires had broken during on and off use. When no additional breakage occurred over the 12-month test period, it was concluded that optical laboratory personnel had unduely stressed the eyewires of the frames that had succumbed. There is a different consistency in Optyl and the cellulose acetate material under the heat cycle for lens insertion, and the opticians believe that a number of Optyl frames were "traumatized" in their learning to work with the thermosetting plastic.

Single events at temperature extremes occurred which bear mention. An Optyl frame on the dash of an auto left in the sun on a hot summer day was "pretzled" when found; and the lenses separated from an Optyl frame which was in the glove compartment of a car parked overnight in -40°F temperature. It was a simple matter for the optometry clinics to put the spectacles back in operating order the next day. The USAFSAM Research Optical Unit could not reproduce the cold weather lens separation even with -60°F temperature trials.

CONCLUSIONS

1. Opticians prefer the plastic to the metal framed spectacles for the fabrication ease which the plastic provide.
2. Environmentally, the metal frames withstand temperature extremes better than thermosetting plastic when in a storage situation, but no difference appeared with respect to spectacles being worn.
3. On an individual feature comparison basis there was little difference between plastic and metal, but overall the HGU-4/P frame was preferred to the Optyl frame tested.

RECOMMENDATIONS

Maintain the present HGU-4/P frame for aircrew use and consider frame redesign in metals which do not require gold finishing. Thermosetting plastic frames exhibit characteristics which are competitive with the metal frames under worldwide climatic conditions across a wide range of Air Force jobs. It is possible that a frame of Optyl composition specifically designed for flyer use would find greater acceptability than the HGU-4/P. A major factor in deciding whether to convert to a thermosetting plastic aircrew frame would be the possibility of a significant cost savings to the Government.

ACKNOWLEDGMENTS

The technical support by opticians TSgt Robert E. Swarm, A1C John C. Pierce, and A1C Terry J. Hardwick made it possible to meet the distribution time tables with quality spectacles. Their participation is sincerely appreciated.

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TABLE 1. OPTYL FRAME STUDY
SAMPLE SIZES

Base	Response	5 months Yes	No	Total
ND (Minot AFB ND)				
	12 months Yes	49	4	53
	12 months No	34	13	47
	Total	83	17	100

	Response	5 months Yes	No	Total
NV (Nellis AFB NV)				
	12 months Yes	26	7	33
	12 months No	35	32	67
	Total	61	39	100

	Response	5 months Yes	No	Total
SC (Charleston AFB SC)				
	12 months Yes	47	7	54
	12 months No	29	17	46
	Total	76	24	100

	Response	5 months Yes	No	Total
ALL				
	12 months Yes	122	18	140
	12 months No	98	62	160
	Total	220	80	300

TABLE 2. ACCEPTABILITY OF "WEIGHT ON FACE"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	13.5[a] (14)	18.3 (19)	68.3 (71)
	12 mo	13.1 (8)	6.5 (4)	80.3 (49)
NV	5 mo	31.5 (17)	31.5 (17)	37.0 (20)
	12 mo	17.4 (4)	43.5 (10)	39.1 (9)
ALL	5 mo	19.6 (31)	22.8 (36)	57.6 (91)
	12 mo	14.3 (12)	16.7 (14)	69.0 (58)

[a]Percentage with sample size in parentheses.

TABLE 3. ACCEPTABILITY OF "COMFORT WITH HELMET"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	18.2[a](4)	31.8 (7)	50.0 (11)
	12 mo	28.6 (4)	21.4 (3)	50.0 (7)
NV	5 mo	65.4 (17)	26.9 (7)	7.7 (2)
	12 mo	58.3 (7)	25.0 (3)	16.7 (2)
ALL	5 mo	43.8 (21)	29.2 (14)	27.1 (13)
	12 mo	42.3 (11)	23.1 (6)	34.6 (9)

[a]Percentage with sample size in parentheses.

TABLE 4. ACCEPTABILITY OF "COMFORT WITHOUT HELMET"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	13.3[a](11)	16.9 (14)	69.9 (58)
	12 mo	20.4 (10)	14.3 (7)	65.3 (32)
NV	5 mo	41.7 (20)	20.8 (10)	37.5 (18)
	12 mo	36.8 (7)	26.3 (5)	36.8 (7)
ALL	5 mo	23.7 (31)	18.3 (24)	58.0 (76)
	12 mo	25.0 (17)	17.6 (12)	57.4 (39)

[a]Percentage with sample size in parentheses.

TABLE 5. ACCEPTABILITY OF "FIELD OF VIEW"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	14.6[a](15)	29.1 (30)	56.3 (58)
	12 mo	8.2 (5)	31.1 (19)	60.7 (37)
NV	5 mo	46.3 (25)	24.1 (13)	29.6 (16)
	12 mo	52.2 (12)	21.7 (5)	26.1 (6)
ALL	5 mo	25.5 (40)	27.4 (43)	47.1 (74)
	12 mo	20.2 (17)	28.6 (24)	51.2 (43)

[a]Percentage with sample size in parentheses.

TABLE 6. ACCEPTABILITY OF "ABILITY TO STAY IN PLACE"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	21.4[a] (22)	14.6 (15)	64.1 (66)
	12 mo	23.0 (14)	24.6 (15)	52.5 (32)
NV	5 mo	35.2 (19)	31.5 (17)	33.3 (18)
	12 mo	50.0 (11)	31.8 (7)	18.2 (4)
ALL	5 mo	26.1 (41)	20.4 (32)	53.5 (84)
	12 mo	30.1 (25)	26.5 (22)	43.4 (36)

[a]Percentage with sample size in parentheses.

TABLE 7. ACCEPTABILITY OF "LOSS OF SCREWS"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	14.6[a] (15)	36.9 (38)	48.5 (50)
	12 mo	22.4 (13)	50.0 (29)	27.6 (16)
NV	5 mo	19.2 (10)	61.5 (32)	19.2 (10)
	12 mo	22.7 (5)	59.1 (13)	18.2 (4)
ALL	5 mo	16.1 (25)	45.2 (70)	38.7 (60)
	12 mo	22.5 (18)	52.5 (42)	25.0 (20)

[a]Percentage with sample size in parentheses.

TABLE 8. ACCEPTABILITY OF "EASE OF FRAME PLACEMENT"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	31.8[a] (7)	36.4 (8)	31.8 (7)
	12 mo	23.1 (3)	38.5 (5)	38.5 (5)
NV	5 mo	60.9 (14)	39.1 (9)	0.0 (0)
	12 mo	41.7 (5)	41.7 (5)	16.6 (2)
ALL	5 mo	46.7 (21)	37.8 (17)	15.6 (7)
	12 mo	32.0 (8)	40.0 (10)	28.0 (7)

[a]Percentage with sample size in parentheses.

TABLE 9. ACCEPTABILITY OF "EFFECT UPON ACOUSTIC SEAL"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	14.3[a] (5)	57.1 (20)	28.6 (10)
	12 mo	22.2 (4)	50.0 (9)	27.8 (5)
NV	5 mo	33.3 (8)	62.5 (15)	4.2 (1)
	12 mo	27.3 (3)	63.6 (7)	9.1 (1)
ALL	5 mo	22.0 (13)	59.3 (35)	18.6 (11)
	12 mo	24.1 (7)	55.2 (16)	20.7 (6)

[a]Percentage with sample size in parentheses.

TABLE 10. ACCEPTABILITY OF "RUGGEDNESS"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	14.0[a](13)	23.7 (22)	62.4 (58)
	12 mo	24.5 (13)	20.8 (11)	54.7 (29)
NV	5 mo	20.8 (10)	35.4 (17)	43.8 (21)
	12 mo	25.0 (5)	45.0 (9)	30.0 (6)
ALL	5 mo	16.3 (23)	27.7 (39)	56.0 (79)
	12 mo	24.7 (18)	27.4 (20)	47.9 (35)

[a]Percentage with sample size in parentheses.

TABLE 11. ACCEPTABILITY OF "LENS RETENTION"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	11.7[a](11)	46.8 (44)	41.5 (39)
	12 mo	16.7 (9)	42.6 (23)	40.7 (22)
NV	5 mo	4.3 (2)	55.3 (26)	40.4 (19)
	12 mo	20.0 (4)	50.0 (10)	30.0 (6)
ALL	5 mo	9.2 (13)	49.6 (70)	41.1 (58)
	12 mo	17.6 (13)	44.6 (33)	37.8 (28)

[a]Percentage with sample size in parentheses.

TABLE 12. "OVERALL ACCEPTABILITY"
(OPTYL TEST FRAME COMPARED TO HGU-4/P)

Base	Evaluation	Worse	Same	Better
ND and SC	5 mo	32.4[a] (36)	11.7 (13)	55.9 (62)
	12 mo	50.8 (32)	6.3 (4)	42.9 (27)
NV	5 mo	78.4 (40)	5.9 (3)	15.7 (8)
	12 mo	75.0 (21)	14.3 (4)	10.7 (3)
ALL	5 mo	46.9 (76)	9.9 (16)	43.2 (70)
	12 mo	58.2 (53)	8.8 (8)	33.0 (30)

[a]Percentage with sample size in parentheses.

TABLE 13. STATISTICAL TESTING RESULTS

Category	ND + SC		NV		ND + SC vs NV	
	5 mos[a]	12 mos[a]	5 mos[a]	12 mos[a]	5 mos[b]	12 mos[b]
Weight on Face	P<.001	P<.001	NS	NS	P<.001	P<.001
Comfort with Helmet	NS	NS	P<.001	NS	P<.001	NS
Comfort without Helmet	P<.001	P<.001	NS	NS	P<.001	NS
Field of View	P<.001	P<.001	NS	NS	P<.001	P<.001
Ability to Stay in Place	P<.001	P<.05	NS	NS	P<.001	P<.01
Loss of Screws	P<.001	NS	NS	NS	P<.01	NS
Ease of Frame Placement	NS	NS	P<.001	NS	P<.01	NS
Effect on Acoustic Seal	NS	NS	P<.05	NS	P<.05	NS
Ruggedness	P<.001	P<.05	NS	NS	NS(P>.05)	NS
Lens Retention	P<.001	P<.05	P<.001	NS	NS	NS
Overall Acceptability	P<.02	NS	P<.001	P<.001	P<.001	P<.01

[a]Two-tailed Sign Test when P = .5 (worse versus better).

[b]Chi-square test results from 2X3 contingency tables.

TABLE 14. FREQUENCIES FOR QUESTIONS 3-11

(a) Question 3

						Question 3									
		Aircrew			Noncrew	Estimate of No. of hours test frames worn daily									
Base	Eval	Pilot	Copilot	Other		No Est	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18
ND	5 mo	2		7	73	17	26	21	12	2	1	1	1	1	
	12 mo			6	47	9	19	14	6	3				2	
NV	5 mo	18		10	33	14	25	13	1	3	2	1		2	
	12 mo	14		2	17	3	15	6	2	3				2	2
SC	5 mo	7	1	16	52	13	18	13	6	2	2	4	3	11	4
	12 mo	6		16	32	4	16	15	4	3	2	2	2	5	1
ALL	5 mo	27	1	33	158	44	69	47	19	7	5	6	4	15	4
	12 mo	20		24	96	16	50	35	12	9	2	2	2	9	3

TABLE 14. (Continued)

(b) Questions 4-6

		Question 4				Question 5			Question 6	
		Type of Headgear				Fit of Frame			Frame Interf	
Base	Eval	Helmet	Headset	Ear Muff	Blank	High	Adeq	Low	Yes	No
ND	5 mo	2	6	3	72	1	78	2	2	20
	12 mo	3	10	2	38	2	47	1	3	19
NV	5 mo	30	2		29	4	49	5	11	18
	12 mo	16			17		25	5	4	12
SC	5 mo		23	4	49	1	70	5	1	17
	12 mo	2	22	4	26		51	3		15
ALL	5 mo	32	8	7	150	6	197	12	14	55
	12 mo	19	10	6	81	2	123	9	7	46

TABLE 14. (Continued)

(b) Questions 7-10

Base	Eval	Question 7 Frame Fit Satis		Question 8 Facial Retention			Question 9 Field of View		Question 10 Appearance	
		Yes	No	Remain Snug	Slip	Fall	Adeq	Inad	Satis	Unsatis
ND	5 mo	68	13	55	21	6	78	4	71	9
	12 mo	39	11	28	19	6	51	2	42	10
NV	5 mo	34	21	26	29	5	37	24	41	18
	12 mo	19	12	16	11	4	15	16	16	16
SC	5 mo	60	15	51	18	5	71	5	73	3
	12 mo	43	9	36	12	6	49	5	52	2
ALL	5 mo	162	49	132	68	16	186	33	185	30
	12 mo	101	32	80	42	16	115	23	110	28

TABLE 14. (Continued)

(c) Question 11

Base	Evaluation	Question 11 Choice of Frame Color: Black	Clear	Blue	Smoke	Dark Brown	Light Brown	Other	Total
NC	5 mo	29	14	5	22	5	5	2	82
	12 mo	20	11	4	10	2	4	2	53
NV	5 mo	20	9	2	18	1	6	5	61
	12 mo	12	5	1	9	2	1	1	31
SC	5 mo	24	24	3	13	3	6	2	75
	12 mo	19	13	3	11	3	2	3	54
ALL	5 mo	73	47	10	53	9	17	9	218
	12 mo	51	29	8	30	7	7	6	138

APPENDIX

SUBJECT QUESTIONNAIRE

1. Name_____ Rank_____

   Mil Address_____ Mil Phone_____

2. Date issued test spectacle frames_____

   Date questionnaire returned_____

3. Aircrew: ____ Pilot ____ Copilot ____ Other_____
   (Specify)

   Nonaircrew: _____
   (Specify)

   Aircrew: Type of aircraft and approx. hours flown in each type during test period:

   a. Type_____ _____Hrs b. Type_____ _____Hrs

   c. Type_____ _____Hrs

   Estimate of number of hours test frame has been worn daily_____

4. Type of headgear worn: _____Helmet_____
   (Specify type)

   _____ Headset _____ Earmuff

   (If more than one type is worn during test period check appropriate lines)

5. Fit of frame in relation to eyes:

   _____ Too high _____ Adequate _____ Too low

6. Did frame interfere with helmet visor movement? _____ Yes _____No

7. Does the test frame fit to your satisfaction? _____ Yes _____No

   If "No" indicate difficulty:_____

8. Rate the facial retention capability of the frame:

   _____ Remained snug _____ Often slipped down on nose

   _____ Fell off face during normal activities

9. Do you think the field of view with the test frame is:

   _____ Adequate _____ Inadequate

   If "Inadequate" please comment:_____

   _____

10. Appearance of test frame: _____Satisfactory _____Unsatisfactory

    If "Unsatisfactory" please comment:_____

    _____

11. If choice of frame color was available, which would you choose?

    ____ Black ____ Clear ____ Blue ____ Smoke ____ Dark Brown

    ____ Light Brown ____ Other_____

To be completed only by personnel that have wear experience with the aircew metal frame.

12. Please use the following scale to compare the test frame with the standard metal flying goggle: (Check each item in comparison area by scale value)

	Values
Test Frame strongly superior	(+3)
Test Frame moderately superior	(+2)
Test Frame slightly superior	(+1)
No difference	0
Metal Frame slightly superior	(-1)
Metal Frame moderately superior	(-2)
Metal Frame strongly superior	(-3)

Comparison Areas:

(a) Weight on face_____

(b) Comfort with helmet overall_____(If worn)

(c) Comfort without helmet_____

(d) Field of view_____

(e) Ability to stay in place on face_____

(f) Loss of screws_____

(g) Ease of frame placement and removal with helmet on_____

_____(If worn)

(h) Effect upon acoustic seal of headgear_____

_____(If worn)

(i) Ruggedness_____

(j) Lens retention_____

Please list any general comments you may have about this particular frame.

_____

_____

_____

_____

_____

_____

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